IN THE SPECIFICATION

[3] To form the threads in a part, the tapping tool is rotationally driven in a forward direction. Once the tapping tool reaches ~~a the~~ desired depth, the motor must be stopped ~~and so that~~ the tapping tool ~~may be~~ rotationally driven in the reverse direction to retract the tapping tool from the part. Relatively large motors are used in the tapping machine so that a significant amount of kinetic energy must be overcome in stopping the motor. Moreover, the motors have special control packages relating to stopping and changing the rotational direction of the motor, and these control packages are expensive to operate and maintain. In addition to the special control packages, the motors themselves are typically specially constructed to perform such a tapping operation. For example, since the lead screw is directly coupled to the motor, the bearings of the motor must withstand the thrust loads during the tapping operation.

[11] The inventive cutting machine 10 is shown in Figure 1. The cutting machine 10 may be used for tapping holes in tapping plates used in oil filters. ~~However, a~~Although the cutting machine 10 is described relative to tapping operations, one of ordinary skill in the art will appreciate that the inventive cutting machine 10 may be used for any number of machining operations.

[12] The cutting machine 10 includes a support structure 12 that comprises various plates and brackets ~~bracketry~~ for supporting the components of the cutting machine 10. First 14 and second 16 motors are mounted on the support structure 12. In one example embodiment, the motors 14 and 16 may be standard 900 rpm 215T frames, which are one-fifth the cost of the tapping motors typically used in tapping machines. The motors 14 and 16 operate continuously in one direction, so there is no requirement for stopping and reversing the motors. This, ~~which~~ increases the motor life and improves ~~extends~~ cycle time. The motor 14 and 16 are controlled by standard AC inverter drives, which are one-tenth the cost of prior art controllers.

[14] The inventive cutting machine 10 may be configured in any number of arrangements. For the example shown, the first 14 and second 16 motors are mounted with their rotational axes parallel to one another ~~in the example shown~~. In that example, the motor axes are offset and parallel to from the axis of the lead screw 24 ~~and parallel to the lead screw 24~~.

[15] The coupling assembly 17 comprises components transferring rotation from the motors 14 and 16 to the tool holder 28. The first motor 14 rotationally drives a clutch/brake 18. The clutch/brake 18 supports a drive sprocket 20 that is coupled to a driven sprocket 22, which is supported on the end of the lead screw 24 opposite the chuck 28, by a drive belt 23. Similarly, the second motor 16 rotationally driven a clutch/brake 32 having a drive sprocket 34. The drive sprocket 34 is coupled to a driven sprocket 36 on the lead screw 24 by the belt 38. The driven ~~driver~~ sprockets 22 and 36 are supported on a jackshaft coupled to the lead screw.

[16] For the example shown, the clutch/brakes 18 and 32 may be double acting piston units available from the Carlson Company, PowerFlo Model No. 1375CAB-CS. Air from an air source 40 is coupled to the clutch/brakes 18 and 32 using pneumatic lines and valves 44. The valves 44 and air source 40 are shown schematically and may be arranged in any suitable manner. When air is applied to a clutch port, a ~~the~~ piston moves to engage the clutch and release the brake. When air is supplied to a brake port, the piston disengages ~~disengaged~~ the clutch and engages the brake. More detail of the operation of the clutch/brakes 18 and 32 will be described below.

[20] Once the forward stroke sensor 50 detects the feature 48, the brake port of the clutch/brake 18 is pressurized to disengage the clutch and engage the brake, which stops the forward rotation of the lead screw 24, as indicated at 70. The clutch/brake 32 of the second motor 16 is manipulated to rotationally drive the lead screw 20 in the reverse direction. Specifically, the clutch port of the clutch/brake 32 is pressurized to engage the clutch and release

the brake which rotationally drives the lead screw 24 rearward through belt 38, as indicated at 72. The tapping tool 30 is retracted as indicated at block 74. The machine 56 moves the next part 58 into the desired position. Once the part position sensor 60 detects the part 58 and the rearward stroke sensor 52 detects the feature 48, the tapping operation is repeated.